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NONWOVEN FABRIC AND MANUFACTURING METHOD THEREOF

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[There are no amendments to this patent.]

Abstract

Objective

To provide projected parts on the surface of a soft nonwoven fabric and improve the wiping performance.

Constitution

Nonwoven fabric (1) which has raised projected parts (4) on one side is obtained by treating a fiber web containing more than 20 wt% of fibers with fineness of less than 1 denier and fiber length of 3-20 mm according to high pressure jet water current on a porous supporter having numerical aperture 2.5-30% and hole diameter 0.2-1 mm and executing confounding and rearrangement of fibers (2). Nonwoven fabric (1) is soft and can scrape off the contaminants with projected parts (4). Fibers (2) are arranged only in the thickness direction of nonwoven fabric (1) at projected parts (4) and capillary mechanism capable of suctioning or feeding water to the wiping surface between fibers (2) functions.

//insert Figure//

Claims

1. A manufacturing method for nonwoven fabric characterized by the fact that a fiber web containing more than 20 wt% of fibers of fineness below 1 denier and fiber length of 3-20 mm in the dry state is composed into a moisture content of 100-500 wt%, guided onto the surface of a porous supporter in which through holes of hole diameter 0.2-1 mm exist in a range of numerical aperture 2.5-30%, then by executing confounding and rearrangement of the fibers by functioning jet water current on said web according to a fiber treatment process, the terminal parts of the fibers flow into said through holes on the supporter contact surface side of said web, arranged in the thickness direction of said web, and form raised projected parts while on the other hand, the fibers are confounded between the through holes, arranged at a parallel to said support surface, and form a smooth surface.

2. A manufacturing method noted in Claim 1 in which said fiber treatment process includes a process of functioning jet water current of 20-40 ml/sec·cm in the cross direction of said web on a non-porous supporter having hardness of over 50 degrees which connects to said porous supporter.

3. A manufacturing method for nonwoven fabric noted in Claim 1 in which said fiber treatment process functions jet water current on said web on a mesh screen which is connected to said porous supporter and forms apertures at the parts corresponding to the knuckles of said screen4. Said nonwoven fabric characterized by the fact that it is a nonwoven fabric which contains more than 20 wt% of fibers with a fineness of below 1 denier and fiber length of 3-20 mm in the dry state and it is composed by the fibers being mutually confounded, and along with the raised projected parts formed by the terminal parts of said fibers being arranged in the thickness direction of the nonwoven fabric existing as dots on one side of said nownoven fabric in a prescribed pattern, a smooth surface is formed between said projections by said confounded fibers being essentially arranged flatly.

Detailed explanation of the invention

[0001]

Industrial application field

This invention relates to a soft nonwoven fabric in which the wiping performance of water droplets, etc., is superior.

[0002]

Prior art

Conventionally, a nonwoven fabric was used as one type of cloth for wiping windows, tables, etc. It is known that a nonwoven fabric can extensively change the performance thereof by suitably selecting the raw material fiber and the manufacturing method. For example, what executes thermal embossing treatment on a nonwoven fabric made with thermoplastic synthetic fibers which provided many irregularities on the surface is convenient for wiping off contaminants since the projections thereof function to scrape off the contaminants from the wiping surface. Also, a nonwoven fabric with confounded fibers of low fineness according to the function of liquid pressure such as water jet currents, etc., is soft compared to a nonwoven fabric with confounded fibers according to thermal fusion or a binder, which is suited for wiping delicate surfaces. For example, the gazette of U.S. Patent Number 3,616,175 discloses a manufacturing technology for a nonwoven fabric out of a favorable wiping performance and external appearance similar to a chamois leather which confounds rayon fibers of below 1 denier on a supporter composed of a plate or a mesh screen according to high pressure water jet current and cites an application example which uses rayon fibers with lengths of about 40 mm.

[0003]

Problem to be solved by the invention

When thermally embossing a nonwoven fabric, it is possible to vary the height of the irregularities according to the embossing condition, and make the wiping off the contaminants effective, but on the other hand the fibers fuse and tend to become lumpy during the embossment, and obtaining a soft touch is difficult. On the other hand, in the manufacturing technology in the gazette of said U.S. Patent Number 3,616,175, a nonwoven fabric with a smooth surface and favorable softness and touch can be obtained by the fibers of a low fineness being arranged flatly, but this nonwoven fabric is not provided with ease in wiping off the contaminants as when the surface is irregular.

[0004]

Therefore, the objective of this invention is to obtain a nonwoven fabric of favorable wiping performance which is efficient at wiping off contaminants by executing the confounding and rearrangement of the fibers by functioning water jet currents on a porous supporter with respect to a web composed of relatively short fibers in the wet state and creating many raised projections on one side.

[0005]

Means for solving the problem

The essence of this invention for solving said problem is as follows.

[0006]

In the manufacturing method for the nonwoven fabric related to this invention, a fiber treatment process is utilized which composes a fiber web containing more than 20 wt% of fibers with a fineness below 1 denier and a fiber length of 3-20 mm in the dry state into a moisture content of 100-500 wt%, guides said fiber web onto the surface of a porous supporter in which through holes with diameter 0.2-1 mm in a range of numerical aperture 2.5-30%, then executes confounding and rearrangement of the fibers by functioning jet water current on the said web. The characteristics thereof are in the fact that according to this treatment process, the terminal parts of the fibers flow through holes on the supporter contact surface side of said web, are arranged in the thickness direction of said web, and form raised projected parts while on the other hand, the fibers are confounded between the through holes, arranged at a parallel to said support surface thereby forming a smooth surface.

[0007]

In an applied mode of said manufacturing method, the treatment process includes a water jet current treatment on a non-porous supporter which is connected to said porous supporter. Also, in another applied mode, it includes a water jet current treatment on a mesh screen which is connected to said porous supporter.

[0008]

The nonwoven fabric related to this invention is characterized by the fact that it is a type manufactured according to the aforementioned manufacturing method and it is a nonwoven fabric which contains more than 20 wt% of fibers of fineness below 1 denier and fiber length of 3-20 mm in the dry state and is composed by the fibers being mutually confounded, and there are raised projected parts on one side which are arranged in a prescribed pattern.

[0009]

Function

In the manufacturing method for the nonwoven fabric related to this invention, the web composed of fibers of relatively low fineness and short fiber length is impregnated with water beforehand so it is stable and the fibers are rearranged without scattering and confounded efficiently when water jet current of

high pressure is made to function on this web. Short fibers tend to flow into the through holes of the supporter during the rearrangement and the fiber terminal ends which are flowed into are arranged in the thickness direction of the web and form raised projected parts on the supporter contact surface of the web while on the other hand, the fibers mutually confound between the through holes arranged at a parallel to the flat surface of the supporter forming a smooth surface.

[0010]

The nonwoven fabric related to this invention has a low fineness, the fibers are mutually confounded only with water currents without utilizing thermal fusion or a binder, and moreover, it is soft and has favorable touch due to many raised projected parts on one side, and when a contaminated surface is wiped with this nonwoven fabric, the contaminants can be scraped off with the projected parts. At the projected parts, moisture can be absorbed quickly from, for example, a wet wiping surface according to the capillary mechanism created between the fibers arranged in the thickness direction.

[0011]

Application examples

When the details of this invention are explained based on the appended figures, it is as follows.

[0012]

Figure 1 is a perspective view of a nonwoven fabric (1) related to this invention. The front surface side of nonwoven fabric (1) is comprised of smooth surface (3) at which fibers (2) mutually confound by being flatly distributed, and projected parts (4) formed by terminal parts (5) of fibers (2) are raised in the thickness direction of nonwoven fabric (1) from the smooth surface (3), where the back surface side is smooth too.

[0013]

Figure 2 shows an X-X line cross section of Figure 1. Fibers (2) are mutually confounded and are distributed in a layer shape in the thickness direction between the front and back surfaces of nonwoven fabric (1). Projected parts (4) manifest a raised outer appearance according to many terminal parts (5) arranged in the thickness direction, and the nonwoven fabric manifests a raised outer appearance as a whole when the distribution density of said projected parts (4) is high.

[0014]

Nonwoven fabric (1) is composed of polyester fibers with fineness of 0.7 denier and fiber length 10 mm and the projected parts (4) have a height from the base of 0.05-1 mm, and a diameter at the base part of 0.2-1 mm, occupying a percentage with respect to the nonwoven fabric surface area of 2.5-30%,

which can apply a surface pattern on nonwoven fabric (1) by being composed into a suitable arranged pattern.

[0015]

Figure 3 shows a schematic process diagram for manufacturing nonwoven fabric (1). This manufacturing process has first, second, and third endless belts (101), (102), and (103) which advance from the right to the left in the figure, roller (104) interposed between second and third endless belts (102) and (103), dewatering · dryer (105) which covers one portion of third endless belt (103), etc., first nozzle (111) is hung above first endless belt (101) in the cross direction of the belt, second, third, and fourth nozzles (112), (113) and (114) above second endless belt (102), and fifth nozzle (115) above roller (104), and the water quantity from the nozzles is approximately the same in the cross direction thereof. Water is jetted at a low pressure of 3-10 kg/cm^2 from first nozzle (111) and high pressure water of 30-130 kg/cm^2 is jetted from second, third, and fourth nozzles (112), (113), and (114) and fifth nozzle (115).

[0016]

Figure 4 is a partial top view of second endless belt (102). Through holes (121) of hole diameter 0.2-1 mm arranged in a prescribed pattern are perforated in said belt (102) at numerical aperture of 2.5-30% and can discharge the water jetted onto belt (102) in Figure 3 into water collecting pan (116). In relation to water discharge, first endless belt (101) is operated by making

the water quantity of first nozzle (111) relatively low and through holes are not always necessary in second endless belt (102). Also, at roller (104), the jetted water falls down rapidly along the roller surface. Discharging the jetted water rapidly from the top of the supporter such as a belt, etc. is known as a common technology for confounding fibers efficiently according to the jetted water.

[0017]

Random web (151) composed of polyester fibers (2) of fineness 0.7 denier, fiber length 10 mm, and basis weight 70 g/m^2 is placed on first endless belt (101) and is transferred to second endless belt (102) as web (152) in the wetted state containing 100-500 wt% of water according to the water jetted from first nozzle (111). Fibers (2) of web (152) are mutually confounded by being treated with high pressure jet of water from second, third, and fourth nozzles (112), (113), and (114) in which the water pressure was set to get higher successively then composed into web (153) of the newly arranged state. In this web (153), a tendency for fibers (2) to be arranged at a parallel to the advancing direction of second endless belt (102) is indicated and a smooth surface complying to the surface of belt (102) is formed on the contact surface of said belt (102). On the through hole (121) and the circumferential edge thereof, fibers (2) flow into through hole (121) along with the water discharge and the terminal part thereof is arranged towards the bottom of through hole (121). High pressure water of 70-130 kg/cm^2 is jetted to web (153) on roller (104) to raise the confounding density of fibers

(2) and to be composed into web (154). Web (154) is wound after being transferred to third endless belt (103) and being dewatered and dried by dryer (105) to compose the nonwoven fabric (155) which is the completed product. This nonwoven fabric (155) is the same as nonwoven fabric (1) shown in Figures 1 and 2, the contact surface to second endless belt (102) is the surface of nonwoven fabric (1), the part fiber (2) flowed into through hole (121) is raised projected part (4), and in between projected parts (4) is smooth surface (3). In nonwoven fabric (155), the surface opposing nozzles (111)-(115) constitute the back surface of nonwoven fabric (1).

[0018]

It is possible to use a fiber web containing more than 20 wt% in the dry state of suitable fibers which have a fineness below 1 denier and fiber length of 3-20 mm as web (151) in this application example. If the fineness is greater than 1 denier, the softness of the nonwoven fabric is lost and becomes unfavorable. If the fiber length is shorter than 3 mm, it becomes difficult to be mutually confounded and the amount of fibers (2) being lost with the discharged water through holes (121) becomes great, making it unfavorable. On the other hand, if the fiber length is longer than 20 mm, it becomes difficult for the fibers to flow towards through holes (121) and the number of fibers per fixed basis weight becomes low. Thus the number of fiber terminal parts minimizes and forming projected parts (4) becomes difficult. Similarly, when the use quantity of the necessary fiber is less than 20%, formation of projected parts (4) is

difficult, and moreover, results in the nonwoven fabric (1) lacking softness.

[0019]

When using roll (104) and fifth nozzle (115) in the manufacturing process, the hardness of the roll is set at over 50 degrees so that use of high pressure water jet can be endured. By setting the water jet quantity at 20-40 ml/sec·cm² in the cross direction of web (101), the fiber confounding density can be increased while efficiently eliminating the water jet along the roll (104) surface. When the water pressure and the number of nozzles above second endless belt (102) are suitably set and a high enough confounding density has been obtained on said belt (102), it is possible to omit the roll (104) and fifth nozzle (115). Also, if web (153) is treated using a suitable number of nozzles and a mesh screen belt instead of the combination of roll (104) and fifth nozzle (115), it is possible to provide apertures complying to the knuckles at the parts corresponding to the mesh knuckles.

[0020]

In nonwoven fabric (1) according to this type of manufacturing method, it is possible to arrange fibers (2) at projected parts (4) in the same direction as the thickness direction. As a result, if nonwoven fabric (1) is wetted with water, it is possible to feed the water to the wiping surface according to the capillary mechanism between fibers (2) and wet

the surface thereof rapidly. Also, by contacting dry nonwoven fabric (1) on the wiping surface wetted with water, the water can be absorbed rapidly according to said capillary mechanism.

[0021]

Effect of the invention

The nonwoven fabric related to this invention is confounded with fibers of low fineness according to high pressure water current so the touch is soft. Projected parts are provided on the surface so the contaminants on the wiping surface can be scraped off with the projected parts. Fibers are arranged in the thickness direction of the nonwoven fabric at the projected parts so the capillary mechanism functions between the fibers and becomes easy to wet the wiping surface with water or to absorb the water from the wiping surface.

Brief explanation of the figures

Figure 1

A perspective view of a nonwoven fabric related to this invention.

Figure 2

An X-X line cross section view in Figure 1.

Figure 3

A schematic diagram of a nonwoven fabric manufacturing process.

Figure 4

Partial top view of the second endless belt.

Brief explanation of the numbers

(1)...nonwoven fabric, (2)...fiber, (3)...smooth surface, (4)...projected part, (5)...terminal part, (102)...porous supporter, (104)...non-porous supporter, (121)...through hole, (151)...fiber web.

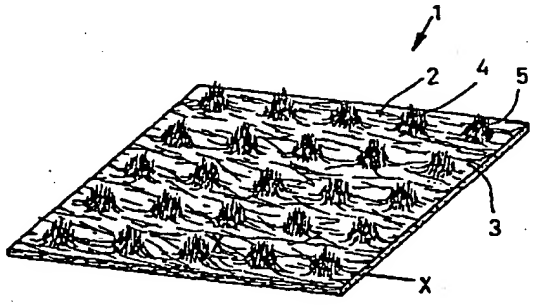

Figure 1

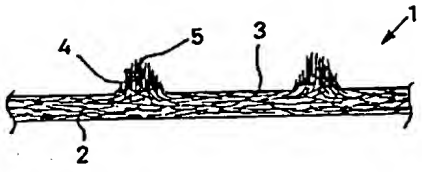

Figure 2

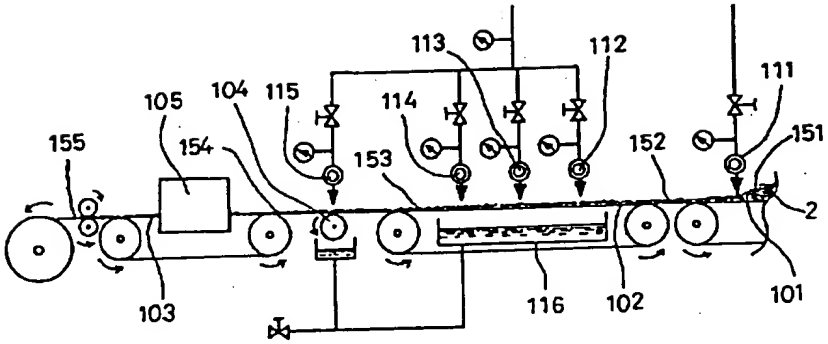

Figure 3

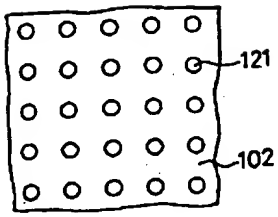

Figure 4

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